1. Upon the effective date of the Commission's adoption of DAB rules and designation of a DAB standard, all broadcasters will be authorized to immediately begin simultaneously broadcasting analog and digital radio signals in the interim hybrid mode. The combined analog and digital transmissions will be required to transmit in a manner consistent with the Commission's hybrid emission mask for FM and AM, respectively.[88] Each broadcaster will be required to notify the Commission within five days of the commencement of the digital transmission.

2. On the twelfth anniversary of the effective date of the new DAB rules, broadcasters will be allowed to increase the power and the bandwidth of the digital carriers in a manner consistent with a new digital mask as specified in proposed Section 73.323 to be incorporated in the Commission's Rules.

These rules establish a date when analog radio will no longer be protected from interference from digital radio. At the same time, they ensure the continued viability of analog radio for a limited but reasonable period of time. Specifically, twelve years after the effective date of the DAB rules, broadcasters will be allowed to increase the power and, in the case of FM, bandwidth of the digital signal.[89] This transition period, and the inherent benefits of DAB, should provide ample incentive for listeners and broadcasters to migrate to DAB.

The twelve year period is an appropriate transition period for most FM broadcasters. USADR's research indicates that approximately 10% of Arbitron-rated stations and 4% of non-Arbitron-rated AM and FM stations purchase new transmitters annually. Assuming this trend

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88 *See* proposed Sections 73.130 (AM) and 73.325 (FM).

89 To the extent the Commission authorizes earlier termination of analog broadcasting, the USADR system has the flexibility to accomplish this goal in many cases.

continues, twelve years is a reasonable time-period to allow radio broadcasters to upgrade to DAB in a manner consistent with regular equipment replacement schedules.

Likewise, listeners will be put on notice that twelve years after DAB rules are adopted, analog signals could be subject to potentially greater interference. This period should provide listeners ample opportunity to upgrade to DAB because it is longer than normal consumer replacement schedules for radio receivers. According to a recent survey,[90] radio receivers are routinely replaced based on the following schedule

	Earliest Replacement (Years)	**Latest Replacement (Years)**	**Average Replacement (Years)**
Personal stereos	1	10	5
Audio hi-fi systems	4	10	9
Table top and clock radios	5	8	7

Automobile receivers are replaced or retired in twelve years or less. The mean age of automobiles today is 8.1 years.[91] This indicates that the vast majority of automobile receivers are replaced or retired in 12 years or less.

When considering the numerous benefits of digital audio, the twelve year transition period and the relatively low incremental cost of including digital capability in DAB receivers consumers should have ample incentive to upgrade to DAB. These circumstances, coupled with listeners' familiarity with the advantages of digital audio technology through use of other

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[90] Appliance Magazine, September 1998.

[91] Polk Research for CEMA Mobile Electronics Market Trends Guide.

products and services, such as compact discs, DAT, DVD, digital audio cable and, in the near future, satellite DARS, should expedite the transition.

All the incentives for broadcasters and listeners to migrate to DAB will also encourage consumer electronics equipment manufacturers to produce DAB receivers. Additionally, the minimal costs associated with the upgrade of radio to digital will provide further incentives to manufacture digital receivers. The digital processing chips are the components which drive the marginal cost increase of the digital receiver. The cost to produce these devices will be modest relative to the total cost of most radios. In a situation involving a modest incremental cost such as this one, manufacturers are likely to incorporate DAB in all receivers as an enhanced feature (such as noise reduction) rather than treating DAB as a new product.

D. The Commission Should Designate a Transmission Standard for IBOC DAB

USADR requests that the Commission designate a transmission standard for IBOC DAB.[92] A government-mandated single standard is required by virtue of the ubiquitous nature of radio, the technical characteristics of IBOC DAB systems, as well as the non-integrated structure of the U.S. radio market. It is only through a standard that the public interest in the development

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[92] The Commission has the authority to designate a transmission standard for IBOC DAB if it determines that a standard is in the public interest. Section 302(a) of the Communications Act of 1934, as amended, 47 U.S.C. § 302(a), provides in part:

> The Commission may, consistent with the public interest, convenience, and necessity, make reasonable regulations (1) governing the interference potential of devices which in the operation are capable of emitting radio frequency energy by radiation, conduction, or other means in sufficient degree to cause harmful interference to radio communications; and (2) establishing minimum performance standards for home electronic equipment and systems to reduce their susceptibility to interference from radio frequency energy.

of new digital radio services and maintenance of the universally available existing radio service can be achieved.

The CRA Report contains an economic analysis that establishes those market conditions requiring a government-mandated standard and demonstrates that digital radio satisfies such conditions. This report concludes that there exists both an inherent need for a transmission standard and a corresponding lack of obvious private sector mechanisms for the expeditious and coordinated decisionmaking required to fashion such a standard. It further notes that the U.S. radio market requires a standard to ensure compatibility between digital receivers and transmitters, as there is no viable private mechanism to ensure coordination among the various entities with diverse interests that participate in the U.S. radio market (*e.g.*, radio broadcasters entities, consumers, and equipment manufacturers). This environment significantly handicaps the market's ability to formulate a standard without government action.

The Commission has mandated standards for broadcast services where two conditions are met: (1) there is a substantial public benefit from a standard, and (2) private industry either will not, or cannot, produce a standard because the costs of standard setting outweigh the private benefits, or a number of different systems have been developed and private industry cannot agree which should become the standard.[93] The circumstances that exist in the incipient U.S. DAB market satisfy both of these conditions.

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[93] *See Fifth Further Notice of Proposed Rulemaking* in MM Docket No. 87-268, 11 FCC Rcd. 6235, 6247 (1996) (*citing* Stanley M. Besen and Garth Saloner, "*The Economics of Telecommunications Standards*," in *Changing the Rules: Technological Change, International Competition, and Regulations in Communications*, Robert W. Crandall and Kenneth Flamm, eds. (The Brookings Institution, 1989)).

1. A standard is required to ensure the development of a DAB system in the United States.

The characteristics of radio broadcasting make the selection of a required broadcast standard critical, because it will foster the necessary coordination between broadcasters' decisions to purchase transmitters and listeners' decisions to purchase receivers. Failure to coordinate these purchasing decisions will cripple the development of DAB and broadcasters' ability to provide the ubiquitous service expected by listeners. The purpose of a transmission standard is to ensure seamless compatibility between transmitters and receivers. The CRA Report notes that radio is characterized as an "open" system, where the respective decisions to purchase transmission equipment and receivers are made by different entities.[94] This is in contrast to a subscription service that involves service providers that control both transmission and reception equipment. Where systems are open, as is the case with radio, standards are required to ensure system compatibility. Otherwise, DAB receivers will not be able to decipher DAB transmissions.

In order to obtain this compatibility, broadcasters, consumer electronics equipment manufacturers, retailers and consumers must coordinate their DAB technology decisions. As the CRA Report notes, broadcasters must transmit signals that are compatible with receivers manufacturers are willing to produce, retailers are willing to carry and consumers are willing to purchase.[95] Absent coordination among all of these groups, no one will have an incentive to

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[94] CRA Report at 13.

[95] *Id.*

purchase and install the equipment necessary to establish a DAB system in the United States. Broadcasters will be concerned that an insufficient number of listeners will purchase receivers that are compatible with the broadcasters' transmissions. Likewise, manufacturers will not produce and listeners will not purchase digital receivers unless they can be assured that broadcasters will offer compatible transmissions. Coordination among these groups is necessary if a DAB system is to develop in the United States A digital radio standard is required to achieve this coordination.

2. A DAB transmission standard should include necessary technical elements to ensure compatibility.

An IBOC DAB transmission standard is required in order to ensure the necessary universal compatibility between DAB transmitters and receivers. The IBOC DAB standard should therefore include all technical elements to ensure system compatibility. First, the standard must include an audio compression or source coding (the "codec") standard.[96] The audio encoder and decoder are vital elements of an IBOC DAB system. If a broadcaster transmits information that has been encoded, it cannot be received unless the receiver has a decoder based on the same system. Second, the transmission standard should include specifications for forward error correction and interleaving codes. Like the codec, the codes embedded in the transmitter for forward error correction and interleaving must match the codes in the receiver. Finally, a modulation standard is required which will assemble the digital bits on carriers, determine how the carriers relate to each other, and determine how the carriers are

[96] A detailed description of the USADR codec appears in Appendix J.

placed in the channel. The benefits of IBOC DAB can only be realized if the transmitter modulated signal can be deciphered by the receiver

3. An IBOC DAB transmission standard will confer substantial public benefits

The principal public benefit stemming from a single standard is the preservation of the ubiquitous properties of radio; a single standard will ensure compatibility between transmission and reception enabling a listener to travel anywhere in the country and be assured of being able to receive the transmissions of all licensed radio stations. An additional benefit is that a single standard will give direction as well as certainty to all interested parties: equipment manufacturers, broadcasters, content providers, and the public. Specifically, a single standard will reduce the risk that equipment manufacturers, broadcasters and consumers may hesitate to invest in a new system for fear of being stranded with an unusable technology. A single standard also increases demand for equipment, which leads to economies of scale for equipment manufacturers and lower costs and increased choice for consumers.

By ensuring compatibility through a transmission standard, radio broadcasting will remain ubiquitous, which is necessary to preserve the radio system as it currently exists in the United States. Radio is an essential communications medium relied upon by virtually all Americans in their daily lives. The CRA Report discusses the two features of radio that consumers expect from radio broadcasting: (1) portability: consumers expect that their radio receiver will receive signals from any station as long as they are within that station's geographical contour; and (2) universal reception: consumers expect to receive all broadcasts

within the area in which they live.[97] Without a single standard, consumers cannot be confident that their receiver will be able to receive all signals across the country, or all broadcasts within a defined area. The existence of multiple, incompatible standards would obstruct this primary customer expectation. A listener traveling from Baltimore to Washington, for example, could suddenly be denied digital radio reception. Likewise, within that listener's primary listening area, an individual listener could potentially acquire only a small percentage of local broadcasts.

The Commission noted in the DTV proceeding that a single standard was important because the vast majority of Americans rely upon TV as their primary source of news and information.[98] Radio broadcasting serves a similar primary function, and is indeed more ubiquitous than television because of its mobility.[99] A standard is required to preserve this essential characteristic and the role of radio.

The Commission has consistently supported standards that promote the rapid development of broadcast technology equipment. The Commission noted in the DTV proceeding, for example, that a single standard provides certainty to consumers, licensees and equipment manufacturers, thereby protecting equipment manufacturers and consumers alike against losses resulting from obsolete equipment.[100] Equipment manufacturers themselves have

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97 *Id.*

98 *Fourth Report and Order* in MM Docket No. 87-268, 11 FCC Rcd 17771, 17787 (1996).

99 Because of its portability, radio can reach listeners at home, in the car, at work, or other away-from-home locations. Listening location can shift dramatically depending on the time of day and day of the week -- for example, listenership rises most noticeably during the morning every weekday. Arbitron, *Radio Today* 5 (1997 ed.). 27% of the radio receivers sold in 1997 were placed in automobiles. CEMA Research Center.

100 *Fourth Report and Order* in MM Docket No. 87-268, 11 FCC Rcd 17771, 17787 (1996).

demanded such certainty in digital broadcast devices, as they have indicated that a single standard is a necessary precondition to their investment in the development of digital radio transmitters or receivers.[101] Similarly, consumers are less likely to purchase digital radio receivers if there is no DAB standard.

The CRA Report notes that the initial absence of a transmission standard and the resulting lack of universal AM stereo reception likely were instrumental in retarding the growth of AM stereo.[102] The Commission should not permit the same result for DAB.

The Commission noted in the DTV proceeding that a single standard would increase competition in price, service, and product features.[103] This rationale for a standard is also present in this instance. The lower costs associated with a single standard will give numerous entities the ability and the incentive to introduce new products and to respond to consumer demand. In return, consumers will have greater access to technology with new features and functions.

Given the critical role of radio, the risk posed by a multitude of incompatible digital transmission standards would be too great, and therefore, the government must take an active role in the development of a DAB transmission standard.

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101 *See* Comments (dated July 11, 1996) and Reply Comments (dated August 12, 1996) of Electronics Industries Association and EIA Advanced Television Committee in HM Report No. 87-268.

102 *See, e.g.*, Stanley M. Besen & Leland L. Johnson, Compatibility Standards, Competition, and Innovation in the Broadcasting Industry 32-58 (1986) (emphasizing lack of standards for AM stereo resulted in production of incompatible equipment and extremely slow adoption by radio stations and listeners).

103 *See Fourth Report and Order* in MM Docket No. 87-268, 11 FCC Rcd. 17771, 17789 (1996); *Fifth Report and Order* in MM Docket No. 87-268, 12 FCC Rcd 12809, 12811 (1997).

4. The Commission is the proper forum for setting the standard

Leaving the task of developing a single standard to the market or private standard setting bodies creates unacceptable risks in this case for several reasons. First, there are likely to be significant differences among the technologies that are competing to become the DAB standard.[104] For instance, today USADR is proposing to use AAC as its codec. If another system used a different codec, the two systems would be incompatible. With non-compatible proprietary codecs, it will be extremely difficult for proponents to align their support behind a single codec. Similar problems are likely to emerge in discussions on forward error correction codes and modulation systems. Additionally, the proponents themselves would have a difficult time reaching consensus given the significant consequences for the distribution of profits among all the proponents. Thus, some proponents may attempt to delay or disrupt the private standard setting process. Given this environment, it would appear that a private voluntary standardization process is likely to be contentious. With no legal means to force a decision, this process could go on indeterminately.

Second, with several competing IBOC DAB systems under development, it is unlikely that the diverse group of entities and interest groups in the radio industry will be able to coalesce around a single standard. Indeed, the broadcasting segment of the radio market itself consists of entities with widely varying interests. Broadcasting stations vary considerably with respect to format, coverage, and quality. AM and FM broadcasters have differing interests, as do

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[104] The Commission recognizes that a strong argument for a required standard exists where there are multiple competing systems. *Fourth Report and Order* in MM Docket No. 87-268, 11 FCC Rcd 17771, 17787 (1996).

commercial and non-commercial broadcasters. Significantly, no single group or coalition exists that is large enough to dictate a standard to others.[105] Broadcasters would thus have difficulty achieving consensus among themselves.

Third, a private standard setting body would be comprised of broadcasters, consumer electronics manufacturers, integrated circuit manufacturers, retailers, consumer groups, and potentially computer manufacturers. Such a diverse group would find it extremely difficult to achieve consensus on a standard.

Fourth, a private voluntary standards process may be subject to significant antitrust scrutiny, which can substantially increase the cost, and slow the progress, of standardization.

Fifth, there is no guarantee that once a voluntary standard has been set that it will actually be adopted by broadcasters.[106]

Finally, a Commission standard is mandated because radio is a basic, ubiquitous communications medium in the United States whose continuous and effective ability to function is critical. The Commission, therefore, has a strong interest in being closely involved in the development of an IBOC DAB standard to ensure that the current radio system continues to function effectively as it transitions to the digital age.

Given the above, without government involvement, it is unlikely that a *de facto* or private standard for IBOC DAB could emerge. Even in the unlikely event that such a standard were ultimately generated through market forces, the process would take a very long time and

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105 CRA Report at 16.

106 *Id.* at 17.

consume a tremendous amount of resources.[107] The Commission's experience with AM stereo is again relevant. In that proceeding, the Commission decided to permit multiple AM stereo standards with the expectation that market forces would generate a *de facto* standard. The presence of multiple incompatible AM stereo systems, however, merely resulted in market confusion.[108]

Thus, as discussed above and in the CRA Report, USADR believes that the public interest will be served by the designation of a DAB transmission standard. It therefore urges the Commission to immediately initiate a process that will culminate in the specification of a DAB transmission standard.

E. The Commission Should Establish a Process to Identify and Evaluate Proposed IBOC DAB Systems

The Commission must make technical decisions regarding DAB interference criteria and transmission standards. This will require the Commission to evaluate the capabilities of each proposed IBOC DAB system. USADR believes that a rulemaking process is the most appropriate mechanism for making these decisions. A rulemaking process provides each proponent the opportunity to place information on the record pertaining to its system's design and performance. All interested parties, including all proponents, will have an opportunity to

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107 In this respect, radio broadcasting contrasts with ancillary and optional services such as, for example, subcarrier data transmissions. It is notable that in the Commission's proceedings concerning subcarrier transmissions standards, the Commission determined that it was sufficient for the Radio Broadcast Data System standard to remain an optional standard in part because of the ancillary nature of the underlying service. *See Memorandum Opinion and Order* in FO Docket Nos. 91-301 and 91-171, 10 FCC Rcd 11494, 11495-96 (1995).

108 CRA Report at 12-13.

comment on this information. Through this process, the Commission will be able to develop a sufficient record to make decisions on interference criteria and transmission standards for IBOC DAB.

The first critical step in this process is the establishment of evaluative criteria to assess the proposed IBOC DAB systems. USADR proposes that the Commission adopt the following criteria to access the capabilities of each proposed system:

- The DAB system should include both AM and FM transmission.
- The DAB system should improve current FM sound quality to virtual CD-quality and current AM sound quality to be comparable to existing FM-quality.
- The DAB system should provide a rational transition path which affords broadcasters and listeners flexibility regarding when to upgrade to digital and which avoids immediately rendering obsolete the existing base of radio receivers.
- A digital signal must have minimal impact on co- and adjacent analog and digital stations.
- A digital signal must have minimal impact on the host analog station.
- A digital signal must serve an area comparable to a station's current analog coverage.
- The DAB system should provide a rational transition for subcarrier services.
- The DAB system should minimize interference from multipath, adjacent channels, noise and grounded conductive structures.
- Digital receivers and transmitters should be available at commercially reasonable prices.
- The DAB system should be able to accommodate future upgrades and features.

The system's performance based on all these criteria, rather than on any particular criterion, should guide the Commission's decision. USADR urges the Commission to immediately adopt the above as the evaluative criteria for analyzing IBOC DAB system proposals.

The second step of the process is the submission of specific information by system proponents. USADR believes that if each proponent provides to the Commission information demonstrating the system's capabilities in each of the above criteria, the Commission will possess a record sufficient to make decisions on technical rules and transmission standards. It is critical that any technical information submitted to demonstrate compliance with this criteria should be based on established scientific data collection methodologies. Information on system performance, therefore, should be based on real-world interference models and confirmed through simulations, laboratory and field tests. Insufficient information on system design and performance should result in that proponent's disqualification from further consideration by the Commission.

In order to ensure that the administrative process is conducted in an efficient manner and that each proponent has sufficient incentive to participate in that process, USADR urges the Commission to establish the following timetable for evaluating DAB systems:

July 1, 1999	Commission publication of IBOC DAB evaluative criteria and system design and performance requirements.
December 15, 1999	Submission of comprehensive design and performance information on all criteria by all system proponents to the Commission.

This timetable will accomplish two important goals. First, it will ensure that the process of evaluating system capabilities will be concluded in an expeditious fashion so that the public can quickly obtain the benefits of IBOC DAB. Second, all legitimate IBOC DAB proponents will be given an opportunity to have their systems evaluated. (The Commission should limit its consideration, however, to proponents that provide the required information by December 15, 1999.) Thus, USADR urges the Commission to establish evaluative criteria, requirements for the submission of design and performance information, and a schedule for submission of information as the basis for its process to review the capabilities of all proposed DAB systems.

X. THE DESIGNATION OF THE USADR IBOC DAB SYSTEM AS THE DAB TRANSMISSION STANDARD WILL SERVE THE PUBLIC INTEREST

USADR believes that its IBOC DAB system meets all the criteria discussed above and should be designated as the U.S. DAB transmission standard. A review of the technical material provided herein demonstrates the performance of the USADR IBOC DAB system in a multitude of environments. The USADR DAB hybrid signal will provide the AM and FM broadcast service with increased sound quality, improved robustness, new features and coverage similar to existing analog coverage. The USADR DAB all-digital signal will provide further improvements to the AM and FM broadcast services In designing its system, USADR took great care to properly balance the technical and market requirements of listeners, broadcasters and consumer electronic manufacturers. For listeners, the USADR DAB system provides an opportunity to upgrade to digital. However, this is not at the expense of listeners who choose to continue to rely on analog radios. Those listeners can continue to use their existing radios for

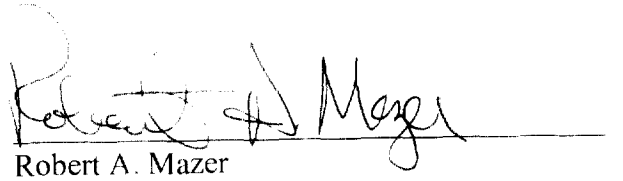
many years in the future. For broadcasters, the USADR design provides the opportunity to offer an improved service in an increasingly competitive marketplace. Finally, for consumer electronics manufacturers, the USADR system establishes an environment that will ensure that there is a efficient migration to DAB. This will provide the assurances necessary to begin to produce DAB radios. USADR believes it has established a rational plan to move radio from the analog to digital world and urges the Commission to expeditiously initiate a proceeding so that the benefits of this transition can be realized by the public.

XI. CONCLUSION

USADR has demonstrated herein the public benefits to be derived from implementing digital AM and FM broadcasting. USADR's development efforts and testing establish the viability and the suitability of IBOC as the means to implement digital radio in the United States. Furthermore, USADR has demonstrated that adoption of the proposed USADR transition plan and the designation of a DAB transmission standard will serve the public interest. It is imperative that, if the public is to reap the benefits of this superior new technology, the Commission should expeditiously establish criteria to evaluate DAB systems and specify a timetable for reviewing each system's capability. USADR believes this system meets all the criteria discussed herein and should be designated by the Commission as the U.S. DAB transmission standard.

Based on the foregoing, USADR respectfully requests the Commission to seek public comment on this Petition and to promptly adopt a Notice of Proposed Rulemaking in order to expedite the introduction of this beneficial enhancement of radio broadcasting.

Respectfully submitted,



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Dated: October 7, 1998

Technical Certificate

I, Brian W. Kroeger, hereby certify that I have either prepared or directly supervised the preparation of all technical information contained in the Petition for Rulemaking of USA Digital Radio Partners, L.P. and that the technical information contained therein is true and correct to the best of my knowledge and belief.

Brian W. Kroeger, D.Sc.
Chief Scientist
USA Digital Radio Partners, L.P.

List of Appendices

Appendix A

Proposed Amendments to Part 73 of the Commission's Rules

§ 73.130 AM Digital Audio Broadcasting.

(a) An AM broadcast station may, without specific authority from the FCC, transmit digital signals upon installation of type-accepted DAB transmitting equipment and the necessary measuring equipment to determine that the combined analog and digital, or a digital only transmission conform to the emissions limitations specified in paragraphs (i) and (ii) of this section.

(i) The measured power spectral density at frequencies removed from the carrier frequency by more than 5 kHz up to and including 10 kHz must not exceed -25 dBc/300 Hz. The measured power spectral density at frequencies greater than 10 kHz, up to and including 25 kHz, from the carrier frequency must not exceed (-30 dBc - 2.0 dB/kHz)/300 Hz. Any emission appearing on a frequency removed from the carrier frequency by 25 kHz or greater shall not exceed -80 dBc/300 Hz.

(ii) Measurements of the combined analog and digital signals shall be made by averaging the power spectral density of the signal in each 300 Hz bandwidth over a 30 second segment of time. Compliance will be determined by measuring the composite of the analog and digital waveform in accordance with Section (b) below. 0 dBc is defined as the total power of the main carrier.

(iii) Measurements of the digital only signal shall be made by averaging the power spectral density in a 300 Hz bandwidth over a 30-second segment of time. Compliance will be determined by measuring the digital waveform in accordance with Section (b) below. 0 dBc is defined as the total power of the main carrier.

(b) Measurements to determine compliance with this section for transmitter type acceptance are to be made using signals sampled at the output terminals of the transmitter when operating into an artificial antenna of substantially zero reactance. Measurements of operating station emissions are to be made at the transmitter's output sampling loop for non-directional stations or at the common point of a directional station.

(c) Licensees of stations transmitting both analog and digital signals complying with the ANSI/EIA-549-1988, NRSC-1 AM Preemphasis/Deemphasis and Broadcast Transmissions Bandwidth Specifications (NRSC-1) for the analog signal, shall modify their audio filters such that the relative amplitude of the analog audio is attenuated -15 dB at 5 kHz sloping linearly to 30 dB at 5.5 kHz. Analog audio in the region 5.5 kHz to 6 kHz shall be attenuated at least -30 dB and decrease linearly from 6 kHz to 10 kHz to 50 dB. All audio energy beyond 10 kHz shall be attenuated in excess of 50 dB.

(d) Should harmful interference be caused to the reception of other broadcast or non-broadcast stations by out of band emissions, the licensee causing the harmful interference may be directed to achieve a greater degree of attenuation than specified in paragraphs (a) and (b) of this section.

(e) Licensees of stations shall notify the Commission within five days of commencement of a DAB transmission.

(f) Digital transmissions in the AM service shall conform to the following characteristics:

[Digital transmission standard to be supplied.]

§ 73.325 FM Digital Audio Broadcasting.

(a) An FM broadcast station may, without specific authority from the FCC, transmit digital audio programs upon installation of type accepted DAB transmitting equipment and the necessary measuring equipment to determine that the combined analog and digital or digital only transmissions conform to the emissions characteristics specified in paragraphs (b) and (c) of this section.

(b) Until December 31, 2011 any station transmitting a digital signal must comply with the following limitations on the transmitted wave

(i) The measured power spectral density of the analog and digital signals at frequencies removed from the center of the channel between 100 kHz and 200 kHz must not exceed -40 dBc/kHz. The measured power spectral density at frequencies removed from the center channel by more than 200 kHz up to and including 250 kHz must not exceed (-30 dBc - 0.2 dB/kHz)/kHz from center. Any emission appearing on a frequency removed from the center channel by 250 kHz or greater shall not exceed -80 dBc/kHz.

(ii) Measurements of the combined analog and digital signals shall be made by averaging the power spectral density of the signal in each 1 kHz bandwidth over a 30-second segment of time. Compliance will be determined by measuring the composite of the analog and digital waveform at the input of the antenna. 0 dBc is defined as the total FM analog power.

(c) Effective January 1, 2012 any station transmitting only a digital signal must comply with the following:

(i) Digital transmissions shall consist of two sidebands occupying 100 kHz to 200 kHz on either side of the center of the assigned channel.

(ii) The measured power spectral density of the digital signal at frequencies removed from the center of the assigned channel between 100 kHz and 200 kHz inclusive must not exceed -20 dBc/kHz. The measured power spectral density at frequencies removed from the center of the channel by more than 200 kHz and up to and including

350 kHz must not exceed (-10 dBc - 0.2 dB/kHz)/kHz from the center frequency. Any emission appearing on a frequency removed from the center channel by more than 350 kHz shall not exceed -80 dBc/kHz.

(iii) The region within 100 kHz from the center channel is reserved for secondary low level data carriers. The operating powers in this region provide 26 dB protection to the first adjacent channel. For stations meeting the § 73.207 minimum distance separation requirements, the level is set at -40 dBc/kHz. For stations not meeting the § 73.207 minimum distance separation requirements, adjustments will be made to insure that the 50/10 interfering contour does not exceed -26 dB at the protected contour of any first adjacent channel.

(iv) Measurements of the digital signal shall be made by averaging the power spectral density in a 1 kHz bandwidth over a 10-second segment of time. Compliance will be determined by measuring the signal at the input of the antenna. 0 dBc is defined as the total digital power.

(d) Compliance with the above requirements shall be demonstrated either by the tests set forth in paragraphs (b) and (c) of this section or other documented test procedures that are to be fully described in the application for type acceptance and the transmitting equipment instruction manual (*see* § 2.983).

(e) Should harmful interference be caused to the reception of other broadcast or non-broadcast stations by out-of-band emissions, the licensee causing the harmful interference may be directed to achieve a greater degree of attenuation than specified in paragraphs (b) and (c) of this section.

(f) The licensees of stations shall notify the Commission within five days of commencement of a DAB transmission.

(g) Digital transmissions in the FM service shall conform to the following characteristics:

[Digital transmission standard to be supplied.]